Using Trig to Make Micro-Molds

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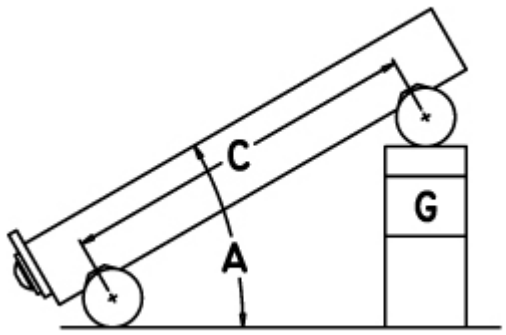
<u>Part I: Overview of Business</u> Accumold in Ankeny, Iowa has been dedicated to micro-molding of parts since 1985. The company uses injection molding techniques to manufacture very small parts for the electronics, fiber optic, medical, and emerging technology fields.	<u>Part II: Job Specifics</u> The tool making division of the company makes the molds used to manufacture the parts through robotic automation technology. These molds must have exact angle and size measurements in order to make quality parts. A measurement error of even .0001 inch can cause a part to be rejected.
<u>Part III: Introduce the Problem</u> A tool maker needs to drill a hole at a specific angle and has decided to use a device called a sine plate to set the part to the correct angle. Given that the sine plate is 4 inches by 4 inches how high should the plate be set to yield the desired angle to nearest 0.0001 inch? Which gauge blocks must be used to build the determined height such that the smallest number of blocks are used in order to reduce error? See graphics on next page.	<u>Part IV: Background</u> Content knowledge needed: • Right triangle trig ratios, law of sines to solve for unknown side • Conversions between fractions and decimals with precision. • Rounding of decimals Business knowledge needed: • Basic injection mold design and function • Grinding in tool making • Need for precision in micro-molding • What is a sine plate
<u>Part V: Business Solution</u> Tool makers use the sine plate and computer software in order to accurately use the grinding machines, drills, etc. to create molds. The process used requires them to make the length or angle larger than necessary then run calculations to determine how much more to take off to reduce waste. You can always take off more but cannot add material back on.	<u>Part VI: Student Solutions</u> Correct height using the sine ratio for various angle measures but may struggle with: • Rounding error • Too much rounding • Determining the correct plates to use in order to create the exact height needed with fewest possible gauge blocks.

Sine Plate Used in Tool Making



Gauge Blocks = G